A Preliminary Lichenometry Study on Rapa Nui – The Rapa Nui Youth Involvement Program Report

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"Himahima-marao ki ai ki roto te Kihi-tupu-henua, ka pu te kihihi"
("Himahima-marao by copulating with Lichen-growing-on-the-soil produced the lichen")

Lichens are an inconspicuous but omnipresent feature of Rapa Nui's rugged semi-tropical environment. A close inspection of any barren surface will often reveal these unique organisms, observable in colorful communities of white, green, grey and orange individual growth forms. Silently persisting, their existence and importance throughout centuries past has never passed unnoticed by islanders, but the interest of researchers from around the world was more recently tapped with the advent of lichen studies in the natural sciences.

The most extensive lichenometric research on Rapa Nui was initiated by a German lichenologist in 1961, Gerhard Follmann. Although Follmann's work is often cited, subsequent lichenometric field research on Rapa Nui has been sparse. However, in 2005, a small group of Rapa Nui high school students and volunteers participating in *'A Pō* – The Rapa Nui Youth Involvement Program - an initiative based at the Museo Antropológico Padre Sebastián Englert, conducted a pilot study at the Ahu Tahira ceremonial site at Vinapu to revisit the issues of lichen growth and the potential for lichenometry on Easter Island. Our field project and research emphasize the potential importance (and high feasibility) of long-term monitoring projects on Rapa Nui, employing technology that was unavailable at the time of Follmann's pioneering work.

LICHENS

Lichens are an outstandingly successful group of organisms, renowned for their ability to survive in environments where others cannot (Hawksworth and Rose 1976). A symbiotic creation resulting from the union of an alga and fungus, lichens take on an encrusting growth form, namely a thallus, which varies greatly in its shape, size, and functional role. Three major growth types are documented: crustose, which grows tightly to its substratum; foliose, which forms leaf-like lobes, arranged radially; and fruticose, which forms a complex branching structure (Armstrong, 2004). Lichens are characteristically slow-growing and long-lived in comparison with other vegetal organisms (Hale 1973), with some species reaching at least 5000 years in the Arctic (Armstrong 2004:33). Lichens are also some of the first colonizers of newly created rock surfaces, and play an important role in the formation of soil by helping to initiate decom-

Figure 1. Photo of typical Rapa Nui lichens at Ahu Tahira, Vinapu. Susannah Rutherford with two Rapanui students, Jasmin Hey and Yanieve Muñoz.

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position processes. They are able to thrive on nutrient-poor substrates – sustained mainly by the air and ambient water – and, lichens are often found in open habitats that lack vegetation (e.g. geologic substrate). In fact, the majority of biodiversity on rocks usually consists of lichen species and in areas without natural rock outcrops, such as the Netherlands and eastern England; lichens often find alternative durable surfaces to grow on (Aptroot and James 2002).

Lichens may play an important role for scientists as a biological monitor for changes in climatic conditions, including air composition and temperature. Lichens are often among the first organisms to indicate signs of air pollution and also impacts of climate change (Armstrong 2000). By studying both lichen growth rates and dendrochronology, scientists have learned more about glacier fluctuations and retreat around the North Patagonia Icefield in southern Chile (Winchester and Harrison 2000). Comparative studies of glaciers in other regions of the world suggest ice-melt due to climatic warming (Armstrong 2000).

Lichen research has focused mainly on North America and Europe in the past, partly due to the remoteness of locations further a-field, e.g. the Southern Hemisphere, an apparent lack of motivation amongst researchers, and also the perceived irrelevance of lichens (McCarthy 2000). The study of Pacific lichen flora is still a fledgling field, although accounts have been published reporting on the lichen of larger island groups such as Hawaii and French Polynesia, and some smaller islands including Rapa Nui, Western Samoa, and Islas Juan Fernandez (Elix and McCarthy 1998; Feurer 2006; McCarthy 2000). New reports that could detail lichen diversity and investigate hypothesized levels of endemism would be welcomed by the academic community (ibid.).

Tremendous potential for lichenometric work on Rapa Nui and in the Pacific remains – not only for climatic or environmental studies, but also for archaeological research. One of the most alluring aspects of Rapa Nui archaeology is the megalithic structures that still exist on the island today. *Moai* (statues), *ahu* (ceremonial platforms), *hare paenga* (boat-shaped houses), and *hare moa* (chicken houses) are just a few examples of the types of megalithic structures that fascinate tourists and offer archaeologists the opportunity to learn more about the Polynesian culture that once flourished on the island. However, these remains, being constructed from volcanic stone, are not conducive to traditional archaeological dating methods (e.g., radiocarbon). Archaeologists, in recent years have sought alternative dating methods for these structures, sometimes resorting to an analysis of stylistic variation in architecture (e.g., Martinsson-Wallin, 1994; Shepardson 2006). By establishing long-term growth rates for various lichen species in different micro-climates of Rapa Nui, archaeologists may acquire yet another analytical tool to better understand Rapa Nui prehistory and episodes of monumental construction throughout prehistory. By measuring the radius of still-living lichen thalli that adorn these megalithic remains and comparing these measurements to control studies, archaeologists could potentially obtain estimated dates for construction, maintenance, or abandonment of different prehistoric sites around the island.

Lichens on Rapa Nui

Historically, European visitors to the island mentioned the presence of lichens on Rapa Nui in numerous accounts. Islanders recognized functions of lichen in a creation chant, recorded by Thomson in 1886 and later published by Métraux:

> "…Kihi-tupu-henua, ka pu te kihihi": "…Lichen-growing-on-the-soil produced the lichen" (Métraux 1940:320).

Although this translation is regarded as 'free' and possibly a misinterpretation of the island's language at that time, it is nevertheless interesting, most especially for the fact that later verses mention ferns, trees including *toromiro*, grasses and other plants by an assortment of different names. Such differentiation reinforces the possibility that an indigenous system of botanical classification existed, which in turn underscores the evidence for islanders' understanding of the surrounding ecology.

Lichens gain further mention in accounts of the island's history. When Pierre Loti visited the island in 1872 and made observations of the monumental stone images, known as *moai*, he wrote, "gnawed by lichens they seem to have the patina of fifty centuries like our Celtic menhirs" (Passos 1971:90). During another expedition to Rapa Nui, Mazière described how islanders held certain *moai* in regard: "The ones that lichen does not grow on are still alive" (Mazière 1968:127).

Moai, a fundamental element of Rapa Nui's widespread intrigue, play a further role in the lichen story. A 'briefer article' within an edition of the 1885 *Botanical Gazette* describes how lichens were discovered growing on stone statues returned to the U.S. Smithsonian Institute by the steamer *Mohican*. The lichens were identified by a Mr. Henry Willey as: *Usnea barbata, Physcia stellaris,* and *Parmelia laeviagata* (Knowlton 1885:94).

Records from the expeditions of the biologists Zahlbruckner (1928) and Skottsberg (1956) document the presence of a number of lichen species on Rapa Nui. Skottsberg (1956) listed 23 lichen species in his report from Juan Fernández and Easter Island, five of which he regarded as endemic. The author noted that such a low number of species illustrated not only, "our insufficient knowledge of the distribution of lichens", but also how little was known of the island's lichen flora (ibid.:415).

The most recent and available up-to-date catalogue of Pacific island lichen species that this report sourced is a publication by Elix and McCarthy (1998), which is available on the internet (Feurer 2006). The checklist records all modern classifications of Rapa Nui's lichen species, a list that currently stands at a total of fifty. The publication re-groups *Physcia picta* from Zahlbruckner and Skottberg's reports as *Dirinaria picta* and Henry Willey's original *Parmelia laevigata* as *Parmotrema laevigata* (Feurer 2006). An interesting aside and reference to *Physcia picta* or *Dirinaria picta* is made to its occurrence on the shell of living Giant Galápagos tortoise – a very long lived and moving substrate! (Hendrichson and Weber 1964).

LICHENOMETRY

Lichenometry (or lichenometric dating), the use of lichen size to determine the age of substrate, was developed by Roland Beschel (1961; Webber and Andrews 1973:295). The basic technique and principles were based on research conducted in the Alps by Beschel, and although it has been highly modified since its original conception, the fundamental assumption remains: a relationship exists between the diameter of the largest lichen body or thallus growing on a surface and the amount of time that surface has been exposed to colonization (i.e. a growth rate).

Lichenometry has many applications. Within the field of geomorphology it is used to date glacial deposits and features, often in arctic and alpine environments. In the case of disturbed substrates (e.g. boulders or exposed rock) lichenometry can provide a minimum value of how long surfaces have remained immobile and undisturbed. Such a methodology relies upon measurements of a specific lichen species, which is usually *Rhizocarpon geographicum* (Beschel 1961; Innes 1985; Winchester 2004). An important point to remember is that age estimates for surfaces can use direct or indirectly gathered data. Direct lichen growth measurements taken annually and plotted over time create a growth chart for a particular species at a certain locale. Subsequently indirect measurements can then be made for another thallus of the same species, ideally in similar environmental conditions, to be compared against the previously plotted growth curve.

Lichenometry has also been applied in archaeological contexts to date exposed surfaces. In Colorado a combination of dating methods were utilized to date a late prehistoric site. Using geologic, lichenometric and radiocarbon dating techniques, the author was able to show that walls and pits used for the capture of grazing animals had been constructed between 950-1000 BP (Benedict 1975). As with all dating methods in archaeological contexts, the chronometric application (and potential) of lichenometry benefited greatly from implementation along with other dating techniques. However, the case remains that in appropriate contexts lichenometric calculations are capable of providing valid estimates of thallus age, and in correlation, a time value for periods of substrate exposure.

GERHARD FOLLMANN

"Gerhard, if you ever go to Chile, don't forget to study the lichens of Easter Island!" Roland Beschel's comment to Gerhard Follmann at the International Botanical Conference in 1959 may have just been a friendly instigation to a new line of academic enquiry, but it was also the moment when using lichens to try to date *moai* was first seriously contemplated (Follmann, pers. comm. 2007).

The work of lichenologist Gerhard Follmann has been pioneering throughout his career, but it was only after the fortuitous meeting with Roland Beschel, the leading expert in the field of lichenometry, that Follmann felt inspired to establish a link with South America that still exists to this day. The long and stimulating conversation between Beschel and Follmann discussed lichen growth rates, life forms, environmental factors and realized a trip to Rapa Nui that could possibly elucidate "a little mystery", and indeed, Follmann is often quoted as the person who "dated the stone statues of Easter Island" (Armstrong 2004:34; Innes 1985:235).

Exploring his native Bavarian highlands as a child, Follmann developed an early instinct for collecting lichens. The area at the time was rich in lichen flora yet he was frustrated by a lack of available books to aid identification. This, however, proved to stimulate and inspire the young German to create his own collection of lichen samples, an endeavour that eventually produced an invaluable reference source. Follmann regarded those early explorations as 'bellicose days' which triggered his lifelong lichen passion and one key observation: lichens often colonize extreme sites inaccessible to other plants. This realization would later prove vital to Rapa Nui studies, where plant cover is very limited. However, it wasn't until Follmann's appointment as a research professor in agronomics of the University of Chile, Santiago, in 1961 that he found the chance to undertake lichen studies on Easter Island.

When Follmann visited Rapa Nui in 1961 the island was without an airstrip and was visited only about once a year by ship at irregular intervals. Upon arrival, Follmann was fascinated by many aspects of the island's environment and landscape, "…the quiet atmosphere, agreeable mild oceanic climate, the well balanced hills, the many stone giants looking so earnestly toward the island's centre" and by it's people, "cheerful, friendly and helpful natives anxious to learn". Follmann was fortunate to meet and work with the gifted Father Sebastián Englert and other missionaries, who generously acted as understanding and cooperative assistants with his lichen studies. Father Englert generously made time to discuss lichens with Follmann and also showed him around the island, visiting the island's *ahu* and *moai*. But most of all, Follmann was excited by the prospect of scouting for lichens and what he found was a "wealth of rather inconspicuous lichen specimens". (Follmann, pers. comm. 2007).

Follmann discussed the methods he applied to measuring lichen growth rates during a recent interview: "In fact, I tried to 'date' the approximate age of some common, more or less crustose lichens with a known growth rate inhabiting the statues, their pedestals, foundations and surrounding free rock faces never hewed before. Provided that the man-made structures had not been cleaned nor painted since their creation and that the colonization by slow growing lichen thalli started early after the completion, the data obtained could be transferred to the rough tufaceous substrate. Of course, it should be taken into consideration that all measurements and comparisons had been realized with the inadequate equipment available in a developing country in those days. Notwithstanding some legitimate objections, these pioneer studies widely attracted attention and the above citation seems to be fairly correct, especially if the adverb 'experimentally' is added to 'dated'." (Follmann, Pers. Comm. 2007).

Follmann study's collected invaluable data on the lichens, enough to be able to conduct lichenometric calculations. Interestingly, Follmann's dates are very close to the estimates that Father Sebastián Englert had established when he placed statue and *ahu* ages between 380-480 years. Follmann looked at lichen growth rates and photographic evidence, compared to Englert who used a timeline based on genealogical records of the island's history. The age Follmann calculated for Vinapu (exact *ahu* not stated) was 460 yrs +/- 7% (using the lichen species *Diploschistes anactinus*) and 380 yrs +/- 8% (*Physcia picta*).

2005: Pilot study at Ahu Tahira

In July 2005, some forty-four years after Follmann's original investigations, a volunteer research team consisting of Rapa Nui high school students and *'A Pō* instructors mapped, measured, described and photographed the lichen present at Vinapu.

The project was designed by *'A Pō* – The Rapa Nui Youth Involvement Program – as an educational outreach effort to offer members of the local Rapa Nui community (especially high school students) the opportunity to work directly with scientists from other countries to learn about the Rapa Nui environment, archaeology, and basic research and computer skills. The study site and, more specifically, Ahu Tahira were chosen for reasons both methodological and pragmatic. First, in order for lichenometric studies to begin an assessment of substrate age, a diachronic dimension that allows for morphological comparison of lichen thallus at varying temporal intervals must be established. This data was available for Ahu Tahira at the Museo Antropológico Padre Sebastián Englert collections in the form of written details and photographs from previous explorations at the site, principally those of Routledge (1919) and Mulloy (1961). Secondly, the site's relatively uniform and stable surfaces were readily accessible for the proposed fieldwork, which required intensive measurement, mapping, and documentation.

A one meter square quadrant, further divided into 10 cm square units, was designated on the planar surface of the west end wall of Ahu Tahira. Corner points were flagged for subsequent sampling visits. The color, form and characteristics of each lichen body were described and digital callipers were used to measure the width and length (mm) of all individual thalli within each 10 cm unit within the quadrant.

The results establish that four main species of lichen presently grow on the basaltic surface of Ahu Tahira, including *Dirinaria* picta (formerly *Physcia picta*) and different *Buellia* species. Many units were found to have a complex matrix of lichens and overlapping lichen bodies or thalli and, also, many miniscule lichens were detectable by eye but were too small to measure or identify. Photographic evidence of each species was collected and the data are currently available to view via the *'A Pō* website.

The detailed study area within our lichenometry project covers only one square meter on the rear-facing wall of the Ahu Tahira ceremonial site. However, the project demonstrates the potential for long-term research on lichenometry along with methods and technology that may prove to be highly effective in lichenometric research on Rapa Nui. Our research combined traditional field methods with digital photogrammetry and geographic information systems (GIS). Detailed photogrammetric documentation of the *ahu* wall provides a long-term comparative basis for more than twenty square meters of surface area containing thousands of lichens. Additionally, the GIS approach seems well-suited for cataloging such a large number of lichens within the composite image from our photogrammetric survey. For additional details regarding the project methodology, please visit *www.terevaka.net/apo/lichen05*.

The future of lichen research on Rapa Nui

Our review of this topic reaffirms that lichenometry is a potentially valuable asset to aid the archaeological dating of select structures on Rapa Nui. Such a scenario is most promising "…where a consistent methodology can be applied involving one species on one type of substrate within a restricted geographical area" (Aptroot and James 2002:247). In this regard, the pilot study of 2005 helps to firmly establish a location-specific dataset with diachronic dimension that can be expanded by future research. However, while lichenometry on Rapa Nui does hold potential there are known limitations that warrant further discussion, as they could ultimately compromise the archaeological

Table 1. Lichen reference key, description and projected species at Ahu Tahira.

Lichen reference	Name	Description	Species
B	Blanco/ White	Foliose, white	*Dirinaria picta*
B1	Blanco 1/ White 1	Crustose, white/grey	
V	Verde/ Green	Crustose, green with small black points	*Buellia* spp.
G	Gris/ Grey	Crustose, dark grey	*Buellia* spp.
G1	Gris 1/ Grey 1	Crustose, light grey	*Buellia* spp.

https://kahualike.manoa.hawaii.edu/rnj/vol22/iss1/5

Table 2. Largest lichen species and length measurement (mm) recorded from each quadrant.

Unit	1	2	3	4	5	6	7	8	9	10
A	B1, 43	B1, 31	V, 32	B1, 51	B1, 58	B1, 38	V, 41	V, 76	B1, 75	B1, 72
B	B1, 59	B, 86	B, 93	B1, 93	B, 85	G, 40	B1, 59	B1, 100	B1, 91	†B1, 72
C	B1, 64	B1, 54	B1, 92	B1, 39	B, 62	B1, 56	B1, 92	B1, 81	B1, 63	B1, 69
D	B1, 100	B1, 95	B, 78	B1, 54	B, 58	V, 87	V, 80	B1, 63	B1, 59	V, 90
E	B1, 100	B1, 77	B1, 85	B1, 79	B1, 43	B, 65	B1, 90	B1, 100	B1, 84	B1, 100
F	B1, 52	B1, 77	B1, 76	B1, 77	B, 86	B, 59	B1, 89	B1, 74	B1, 100	B, 100
G	B1, 30	B, 33	V, 40	B, 34	B, 60	V, 43	B1, 35	B1, 77	B1, 100	B1, 100
H	B, 76	B, 53	B, 63	V, 52	B, 60	B, 52	B, 34	V, 33	V, 100	V, 100
I	B, 89	B, 73	B, 77	B, 56	B, 80	B, 62	B1, 9	B1, 71	B1, 100	B1, 100
J	B, 40	G1, 100*	G1, 100	B, 59	G1, 100*	G, 100	G, 100	G, 100	G1, 100	G1, 100*

† Indicates a unit with complex lichen matrix and overlapping thalli.
* Indicates largest lichen but has other species growing over its surface.

utility of the methodology if not adequately addressed or mitigated.

As many researchers have previously discussed, a multitude of environmental and biological factors affect lichen growth and lichenometric experimental design (Aptroot and James 2002:246; Innes 1985:221; Jochimsen 1973:423; McCarthy 1999:385; Webber and Andrews 1973:296). Lichen growth, which forms the basis of lichenometry, is variable from the point of colonization, and must be considered in terms of physiological and environmental factors (Jochimsen 1973:424). Factors that must be taken into consideration include (in no particular order): rock surface chemistry and weathering rate; climatic variation; symbiotic nature of lichen; individuality of lichen thalli; means of propagation and dispersal; growth rate and senescence; competition; survival or dispersal of mature lichen; and differential attributes, behavior, and function across species. Methodological failures can occur and errors made when recording specific details about thalli, and the correct identification and interpretation of lichen data is essential.

Thus, the application of lichenometry on Rapa Nui and its archaeological features presents many compound factors that must be carefully deliberated. Vinapu and Ahu Tahira are situated within a landscape that is exposed to the elements (110m inland: Mulloy 1961) and one that is also proximate to the island's runway and aircraft flight path: the south west corner of Rapa Nui. Over time, varying degrees of sun, wind, rain and sea spray will affect the microclimate of the basaltic rock surface and lichen growth. Follmann (1961:152) noted that the lichens he observed had a slow growth rate for sub-tropical species. He attributed this to high rock porosity at many sites, low nutrient availability and strong oceanic winds. Lichens with a slow growth rate are more suitable of lichenometric investigations (Innes 1985).

There may also be another consideration for lichen research in the future: air pollution. Lichens are renowned for their subtle growth changes due to air pollution, an attribute that has been used to monitor air pollution in a variety of different environments (Purvis et al. 2002). Any increases in air pollution from cars, motorbikes or airplanes could be reflected in a change of lichen rate of growth due to the sensitivity of lichens to certain chemical compounds. Threats to lichen populations worldwide have been directly and indirectly associated with population growth (Wolseley 1995), and since this is a current trend on Rapa Nui, the need for lichen monitoring is warranted further.

One challenge to conducting lichenometry on Rapa Nui is that few, if any, dated reference lichen substrates exist and therefore estimating a date for lichen colonization becomes problematic. However, direct measurements of lichen growth over a defined time period can help to mitigate this situation. At the study site, it is interesting to note that when the German-Franco expedition of 1988 took a plaster cast mould at the north end of Ahu Tahira, a freshly exposed rock surface was created as the plaster effectively stripped the substrate clean of all lichen growth (*Rapa Nui Journal* 2(2):11). This site could now be monitored for lichen recolonization, establishment and growth. This is exactly the type of data needed as a basis for future lichenometric studies. Ensuring that factors such as possible chemical imbalances caused by the mould-taking process, or residues left reacting with water, are taken into consideration (Smith, pers. comm. 2005), the wall could still be an ideal location for a long-term monitoring project.

Another important component for lichen studies on Rapa Nui is the use of photography to collect primary data, a great asset to a long-term monitoring project. Simple photogrammetric methods have been suggested and employed in the past to measure lichen growth over certain time periods (Brehmer Foyer 1973:321; Brink 1973:330), and even Roland Beschel was known to have stressed the importance of photography to document lichen growth (Webber and Andrews 1973:296). The use of digital photography and its application in long-term lichen monitoring projects have also been previously discussed in terms of lichens and measuring environmental change (Purvis et al. 2002:337). The study, using 15 permanent quadrants and annual photographs over a six-year time period, was able to process images and distinguish growth rate differences between

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different species. Lichen growth and cover was seen to respond directly to concentrations of sulfur dioxide in the air. If, on Rapa Nui, one or more inconspicuous sites were established where permanent quadrants could be placed and photographed on an annual basis. Data for providing a direct indication of growth rates could then be collected. However, on an island such as Rapa Nui where most archaeological sites are subject to high visitation rates, extra requirements might be needed to address potential disturbance not encountered at more isolated study sites.

Conclusion

The insight of previous lichenometric studies combined with the application of new technologies offers great hope for ground-breaking research regarding lichens on Rapa Nui. Follmann thought lichens could elucidate an estimate of substrate age by taking all the limiting factors into consideration, but Follmann qualified such research efforts as "experimental". We believe that, with caution, lichenometry may prove to unravel some of the long-standing archaeological questions on Rapa Nui.

This report has summarized the findings of the *'A Pō* pilot study and concludes that a long-term monitoring project is warranted to re-establish lichen studies on the island and to potentially further both archaeological and biological interests. The results of such a monitoring project would be most suitable to answer further questions and help us understand lichen biology in much greater detail, and everything that impacts their growth on Rapa Nui.

'A Pó means "tomorrow" in the indigenous language of Rapa Nui. The *'A Pō* educational outreach program is dedicated to innovative approaches to education, community involvement, and scientific research in preparation for the future of this unique and fragile island. For further information about *'A Pō*, please visit *www.terevaka.net*. *'A Pō* is funded through donations, and anyone wishing to help support this program can obtain further details via the Easter Island Foundation (U.S. donations are tax deductible).

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An Interview with Gerhard Follmann

by Susannah Rutherford

1. *How did you become a lichenologist ?*

During the children's evacuation to the country in the second part of World War II (about 1943-1945) I came to a small town amidst the Central German Rhoen Mountains. This Bavarian-Hessian highland was decidedly rich in lichens at that time which inspired and helped to develop my early collecting instinct. But unfortunately I was unable to determine and name the gathered and preserved samples by the few, more popular flora cryptograms available. However, such failed attempts, together with the observation that lichens often seemed to colonize extreme sites inaccessible to other plants, just stimulated my ambitions, and that's why those bellicose days might be taken as the "starting point" of my lifelong lichen passion.

2. *How did you first become interested in the lichens of Easter Island ?*

On the occasion of the International Botanical Congress at Montreal, Canada (1959), I had a long and stimulating discussion with the 'father of lichenometry', Roland Beschel (1928-1971), in those days botany professor at Queen's University, Kingston, Canada, on growth rates and life forms of crustose lichens, their relative constancy and eventual interferences of environmental factors. Beschel's final recommendation was "Gerhard, if you ever come to Chile, don't forget to study the lichens of Easter Island; if you're successful you'll be the first lichen specialist having utilized lichenometry in the southern hemisphere, and perhaps you could elucidate a little the mystery concerning the age of the monumental statues" (cited after consultation of diary notes). And following my appointment as research professor for agronomics of the University of Chile, Santiago (1961), I began with my studies on the lichens of Easter Island.

3. *Your work is often cited as having "dated the stone statues". Would you agree ?*

In fact, I tried to "date" the approximate age of some common, more or less crustose lichens with known growth rate inhabiting the statues, their pedestals, foundations and surrounding free rock faces never hewed before. Provided that the man-made structures had not been cleaned nor painted since their creation and that the colonization by slow-growing lichen thalli started early after their completion, the data obtained could be transferred to the rough tufaceous substrate. Of course, it should be taken into consideration that all measurements and comparisons had been realized with the inadequate equipment available in a developing country in those days. Notwithstanding some legitimate objections, these real pioneer studies widely attracted attention and the above citation seems to be fairly correct, especially if the adverb "experimentally" is added to "dated".

4. *How did the research you carried out impact your further work and travels ?*

Unfortunately, other professional obligations prevented a continuation and deepening of my lichen studies on Easter Island. But after these experiences a large part of my subsequent lichenological investigations on ecology, distribution, taxonomy and vegetation, mostly with an applied background, were performed on islands of temperate to tropical zones of the Old as well as the New World (e.g. Azores, Canaries, Cape Verde Islands, Galápagos Islands, Juan Fernández, and Madeira).

5. *What do you remember most vividly about the island from your visit ?*

I was fascinated by the quiet atmosphere on the island and agreeable mild oceanic climate, by the well balanced hilly landscape and the wealth of rather inconspicuous saxicolous lichens, by the many stone giants looking so earnest to the island's centre and last but not least by the cheerful, friendly and helpful natives anxious to learn. Not less I was impressed by the assistance, sympathy and cooperation received from the missionaries of the island, particularly by the late Father Sebastian Englert, who generously found enough time to discuss my intentions and to show me many of his beloved and enumerated Ahus and Moais – but this was in 1961 when there did not exist an airstrip and only one larger ship of irregular schedule reached Rapa Nui each year.

6. *Do many people contact you about the work you did on the island ?*

From the publication of my article on the age of the statues of Easter Island onward I received many inquiries referring to the most diverse subjects, e.g. whether a superficially described or photographed site could be dated by this method, or, on the other hand, if a certain, insufficiently defined lichen species might be suited for such measurements. In some cases I was able to help and rarely this resulted in a productive collaboration, but in view of fundamental misunderstandings repeatedly I had to give a negative reply.

7. *Do you have any advice for future researchers and visitors to the island and South America ?*

Further lichenometrical studies should be extended to more utilizable species, individuals and sites in a statistically unobjectionable way. Simultaneously grid squares should be carefully selected, marked, mapped and regularly recorded by photometric methods. This can be done without disturbing the general impression of the respective structures. The exact determination to species level or below of all lichen taxa included in the observations should be effected or revised by an acknowledged group of specialists. Note that incorrect specifications stand for the incorrect interpretation of all other data! At least three sufficiently labeled type collections of each lichen applicable to lichenometrical measurements on Easter Island should be prepared and deposited at Hanga Roa (Museo Antropológico Padre Sebastián Englert), Santiago de Chile (Museo Nacional de Historia Natural) and at one of the large public herbaria of Europe (British Museum, Natural History, London). This could help to eliminate the omnipresent problem with exact and verifiable identifications. If not yet started, the freshly exposed rock surface of Ahu Tahira caused by a German-French expedition (1988) urgently should be monitored for lichen recolonization, establishment and growth rate, although the possible influence of methyl cellulose and silicone mould applied to produce replicas has to be taken into account. In view of the increasing interest in lichenometrical studies the elaboration of a precise, handy and reliable methodological introduction would be desirable, possibly combined with a key to the most relevant species.

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